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### Youth access to cigarettes across seven European countries

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## Original Investigation

# Youth Access to Cigarettes Across Seven European Countries: A Mixed-Methods Study

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## Abstract

**Background:** Despite widespread age-of-sale restrictions on tobacco, adolescents continue to obtain cigarettes and experiment with smoking. This mixed-methods study aimed to understand how European adolescents access cigarettes and how the policy context may influence this process, using a realist evaluation approach. This is the first study to assess access to cigarettes across various European contexts.

**Methods:** A survey of 4104 students was combined with qualitative data from focus groups among 319 adolescents aged 14–19 across seven European countries. Data were synthesized to explore mechanisms via which young people obtain cigarettes despite age-of-sale restrictions.

**Results:** While purchasing cigarettes from supermarkets was widely regarded as difficult, many participants purchased cigarettes from noncompliant retailers (often in smaller shops or cafes). Other contra-mechanisms included circumventing age checks, proxy purchases, and/or social sources. Dominant forms of access differed across the seven contexts, with direct purchases more common where perceived enforcement was low (eg, Belgium) and proxy purchases more important where perceived enforcement of age-of-sale laws was high (eg, Finland). The effectiveness of age-of-sale restrictions in reducing youth access appears to be influenced by a range of contextual factors including retailer compliance, the availability of vending machines, and the specific minimum age-of-sale.

**Conclusions:** Our findings illustrate the relevance of programme theory in understanding the contra-mechanisms that undermine the effectiveness of age-of-sale laws in discouraging youth smoking. Young people's access to cigarettes could be further limited by addressing these contra-mechanisms, including an increase in the legal sales age (particularly in Belgium), banning vending machines, and strengthening enforcement.

**Implications:** Despite widespread implementation of age-of-sale laws, a substantial proportion of minors continue to access cigarettes. Young people use a number of contra-mechanisms to circumvent age-of-sale restrictions. These include accessing cigarettes via social sources, proxy sales or by circumventing age checks. Our findings show that in contexts where perceived enforcement

of age-of-sale restrictions is high, young people are more reliant on irregular forms of access such as proxy sales. Young people's access to cigarettes may be further reduced by policy interventions that address these contra-mechanisms—for example, banning vending machines, strengthening enforcement of age-of-sale laws, and increasing the minimum age-of-sale.

## Background

While the accessibility of cigarettes is an important influence on youth smoking, our understanding of the relevant mechanisms is limited.<sup>1</sup> All European countries have banned tobacco sales to young people, yet a fifth of 15- to 16-year-olds report having smoked in the past 30 days.<sup>2</sup> There is limited European research examining how young people access tobacco in the presence of age-of-sale restrictions, although evidence from the United States, United Kingdom, and Australia suggests they may buy cigarettes from certain types of retailers or access them from other sources.<sup>3–8</sup> Enforcement efforts have been shown to improve retailer compliance with age-of-sale laws<sup>6,7</sup> and there is some evidence that bans on cigarette vending machines may reduce youth smoking,<sup>9</sup> but little is known about other ways in which efforts to limit youth access may be made more effective.

A recent review examined the relationship between age-of-sale laws and youth smoking behavior.<sup>10</sup> This review took a realist approach, which seeks to examine the mechanisms via which a policy (eg, age-of-sale restrictions) has its effect.<sup>11</sup> These mechanisms are conceptualized as a “programme theory,” which allows researchers to explore how the effectiveness of a particular policy may be affected by contextual factors (including implementation) and may vary for different population sub-groups. This approach has particular relevance in developing and strengthening population-level interventions in real-life settings, where the overall impact of a policy may be influenced by the specific context and aspects of implementation and enforcement.

As part of this review, we developed a programme theory describing two mechanisms via which age-of-sale restrictions are expected to reduce youth smoking, and three potential contra-mechanisms (processes via which intended mechanisms may be undermined).<sup>10</sup> Our findings suggest the primary mechanism via which age-of-sale laws reduce youth smoking is by diminishing the perceived accessibility of commercial sources, thereby discouraging young people from attempting such access ([Supplementary Figure 1](#)); with a secondary mechanism being the potential for age-of-sale restrictions to contribute to the denormalization of smoking amongst youth. While this primary mechanism (reducing the perceived accessibility of cigarettes) appears effective,<sup>12–14</sup> it can be undermined by several contra-mechanisms, including (1) if adolescents find ways of circumventing the ban (such as buying from local stores where compliance is low, borrowing identity cards, or asking others to buy cigarettes for them<sup>3,8</sup>); or (2) obtaining cigarettes from social sources such as peers and family.<sup>7,8</sup>

While much existing evidence focuses on individual and interpersonal factors influencing minors' ability to access cigarettes,<sup>3,10,15,16</sup> there is a need for more research to inform our understanding of how age-of-sale restrictions are affected by aspects of context and implementation, including factors influencing young people's ability to circumvent these restrictions via the contra-mechanisms described above.<sup>13,14,17</sup> Understanding how adolescent access is influenced by factors such as retailer interactions, the legality of tobacco vending machines, and the presence of other tobacco control policies has particular policy salience. Such evidence can shed light on which

broader contextual factors are of importance for optimal effectiveness of age-of-sale laws. In order to support more effective efforts to reduce youth smoking, experts have called for broader cross-disciplinary research exploring the influence of contextual factors on these mechanisms.<sup>1,17</sup>

The aim of this study is to examine how young people in Europe access cigarettes and how contextual factors might influence this access, using a realist evaluation approach. We explore how the mechanism and contra-mechanisms identified in the previous realist review may change or differ across the seven European policy contexts.

We undertook surveys and focus group discussions with students from seven European cities with different geographical and diverse national tobacco control policy contexts. The strength of overall tobacco control varies across the study countries, as reflected by the European Tobacco Control Scale (an indication of countries' relative progress in implementing six key measures deemed cost-effective by the World Bank,<sup>18,19</sup> with Ireland and Finland having the most comprehensive tobacco control policies, Germany having the least comprehensive, and the Netherlands, Italy, Portugal, and Belgium in the intermediate range).<sup>20</sup> All seven countries have implemented an age-of-sale of 18 years old, with the exception of Belgium which has an age-of-sale of 16.<sup>21</sup> Vending machines are allowed in all countries, except for Finland where a vending machine ban was implemented in 2015.<sup>22</sup> Across the seven countries, the estimated prevalence of weekly smoking among 15-year-olds varies from 8% (in Ireland) to 21% (in Italy).<sup>23</sup> The variation in policy context between the countries allowed us to make meaningful comparisons regarding young people's access to cigarettes.

## Methods

### Setting

Data were collected in 17 secondary schools across seven European cities as part of the multi-country SILNE-R project.<sup>24</sup> Data were collected from at least two schools in each study city, with additional schools participating in Amersfoort<sup>1</sup> and Hannover<sup>2</sup> due to local requirements. Schools were purposefully selected by local research teams in order to include at least one school serving a relatively advantaged population (in terms of the socioeconomic profile of the student body) and one a relatively disadvantaged population for each city.

### Surveys

Surveys focused on smoking-related behavior were undertaken in participating schools across the two school years in which most students were aged 14–16. The survey was paper-based, administered during school hours and took approximately 40–50 minutes to complete. Details of the survey design (part of a more extensive school survey) can be found in [Supplementary Box 1](#).<sup>25</sup>

Across the 17 schools, 5137 students were eligible to participate in the survey and 4104 (80%) took part, all of whom were included in these analyses (no data were missing for these questions). Overall, 36.5% of this sample reported ever-smoking. We focus here

on those students who reported smoking in the past 30-days, as this is a commonly used measure of current youth smoking which includes both regular (weekly) and occasional smokers.<sup>2,26</sup> These students were asked what sources they had used to obtain cigarettes in this period. Descriptive statistics were produced by VL and AG using SAS EG version 7.1. Since we are using survey data to contextualize our qualitative findings (rather than attempting to estimate smoking behavior among all young people in the relevant countries), we have reported results as simple proportions without confidence intervals. The survey data were used to contextualize our qualitative findings and were not nationally representative.

## Focus Groups

Eight single-sex focus groups were conducted in each study site to give a total of 56 groups with 319 adolescents (168 girls and 151 boys). Participants were selected by teachers, who were asked to identify students they believed to be smokers or at risk of becoming smokers (ie, with family or friends who smoked). This is a well-established technique used to select participants in qualitative research on youth smoking and sources of cigarettes.<sup>8,27</sup> While most focus group participants were 15 years old, the age range was 14–19 (reflecting the practice in some countries of holding students back at school, so that some year groups included older students). Most focus groups comprised participants under the legal age-of-sale for their country, with the exception of seven focus groups in Belgium, one in Germany, and two in Portugal. Facilitators of these groups asked older students to think back to a time when they were below the legal age-of-sale.

Focus groups were conducted by national research teams following a joint training workshop (led by AA and SH) in which facilitators were familiarized with a collaboratively generated topic guide which covered smoking experiences, access to cigarettes, smoking at school, and school smoking policies. Focus groups were conducted within school hours and premises in the absence of school staff. Each group comprised three to nine students, and lasted 30–90 minutes. At the start of each group, participants gave written consent and completed a short anonymous questionnaire about their background and smoking experience. Half of the participants self-reported as current or former smokers. Focus groups were conducted in the dominant local language and were digitally recorded and transcribed. National research teams translated the transcripts into English for analysis.

Transcripts were uploaded to the qualitative analysis software NVivo version 11 in order to facilitate thematic analysis.<sup>28</sup> An initial coding framework identifying emergent themes was developed using focus group data from three countries (Ireland, the Netherlands, and Portugal) which were collectively reviewed and discussed by three authors (RH, AA, and SH). This initial framework was subsequently reviewed and refined following deep-reading of focus group transcripts from the other four countries. The framework was then used to code transcripts from all 56 focus groups (RH and PN), with any areas of uncertainty resolved via discussion amongst the research group (PN, RH, AA, and SH). A selection of transcripts was coded independently by two authors (RH and PN) and cross-referenced in order to ensure consistency in the coding process.

## Synthesis

Survey results and coded focus group data were brought into dialogue with the previously developed realist programme theory (Supplementary Figure 1) to explore the key mechanism and

contra-mechanisms thought to link age-of-sale restrictions with youth smoking across the seven study sites. By bringing quantitative and qualitative findings into conversation, and comparing these across the seven study sites, we sought to explore how contextual factors may influence these (contra-)mechanisms.

## Ethical Approval

Ethical approval was obtained from the institutions within which local research teams were based (see [Supplementary Box 1](#) for more information). Participants' parents were sent an opt-out consent form in all sites except Hannover (Germany), where opt-in consent was obtained. Focus group participants also provide affirmative consent. Data were collected between September 2016 and October 2017.

## Results

### Overview of Survey Findings

Reported student smoking in the past 30 days ranged from 8% (Germany) to 32% (Italy) with most in the 15%–23% range (Supplementary Table 1). Students who smoked reported accessing cigarettes via a range of sources. Friends were the most commonly reported source, with a third (in Germany) to a half (in Belgium) of smoking students having obtained cigarettes from friends in the past 30 days. Other sources showed greater variation across the seven study sites. Students in Belgium were much more likely to report buying cigarettes from shops (45%) compared to those from other countries (3%–24%). Vending machines were a common source of cigarettes in Portugal (33%) and Italy (16%), with much lower reported use in Belgium and Ireland and none in Finland. Conversely, the proportion of respondents “asking an adult I didn't know to buy [cigarettes] for me” was highest in Finland (8%) and lowest in Belgium (1%).

### Exploration of Programme Theory

Our synthesis of survey and focus group data supported the (contra-) mechanisms proposed in the relevant programme theory, but provided a greater degree of granularity in terms of the strategies used by young people in Europe to access cigarettes. Our findings map onto the existing primary mechanism and the two contra-mechanisms presented in the programme theory (Supplementary Figure 1), while providing a more nuanced account of the processes whereby young people's use of specific contra-mechanisms is influenced by a range of contextual factors.

#### Mechanism: Young People Perceive Difficulty in Accessing Commercial Sources of Cigarettes

In keeping with the principle mechanism described in the relevant programme theory, adolescents across field sites expressed doubt about being able to purchase cigarettes from shops. Consistent with survey findings, participants in Finland appeared particularly unlikely to attempt direct purchase. This reluctance may reflect high enforcement among retailers in Finland, or a strong adolescent belief in such enforcement (which arguably amounts to the same outcome):

*F: Are you able to buy them in any [shop]?*

*All participants: No.*

*P: I haven't even tried.*

*Finland, Girls, High SES*



Participants in several countries (Belgium, Ireland, the Netherlands, and Portugal) indicated that chain stores such as supermarkets were more strictly regulated and often required identification. Portuguese students mentioned shopping centers as particularly inaccessible due to increased security. Participants in the Netherlands noted that supermarket staff could lose their jobs if they sold them cigarettes, suggesting a high level of perceived enforcement:

*F: Alright, and what about shops? Do you know if it's easy to get cigarettes there?*

*P1: No.*

*P2: No, I don't think so.*

*F: That's not easy to do?*

*P2: No.*

*P3: But friends aren't eager to do it for you either because you'll know somebody who works at [supermarket] and then they'll run the risk of getting fired, so they won't do it...*

*The Netherlands, Girls, Low SES*

These findings lend support to the theory that age-of-sale restrictions limit youth access primarily because of adolescents' perception that retailers will not sell them cigarettes. In the following sections, we draw on our data to explore four contra-mechanisms via which young people continue to access cigarettes in the presence of an age-of-sale ban. The first three contra-mechanisms we describe correspond with contra-mechanism A in the relevant programme theory (Supplementary Figure 1), while the fourth describes contra-mechanism B.

#### Contra-Mechanism A1: Some Retailers Do Not Comply With the Law, Allowing Adolescents to Make Direct Purchases

Participants in most sites demonstrated quite sophisticated knowledge of the types of retailers most likely to overlook age-of-sale laws. These typically included local shops, gas stations, and night shops. Students in several countries (Italy, Belgium, Germany, Ireland) reported being asked to hide bought cigarettes before leaving the store, suggesting retailers were aware of selling to minors and were keen to minimize any potential consequences:

*P: Yes, the night shops! [laughs]*

*F: They never check?*

*P: [together]: no!*

*P: They don't care!*

*P: Even if you are 12 years old and you ask him for a packet of cigarettes, he will give it to you without any problem.*

*P: Yes, there was never any problem ...*

*P: Even for strong alcohol ...*

*P: They say "when you go out, put it in your bag".*

*Belgium, Girls, High SES*

The most commonly cited retailers varied across sites, with participants in Belgium referencing night shops, German participants mentioning kiosks and gas stations, students in the Netherlands using gas stations and shops run by immigrants, and those in Ireland mentioning newsagents and corner shops. Despite these contextual differences, the types of shops mentioned shared common features, for example, they were generally small, local, and non-franchised:

*P1: Mary's shop!*

*P2: But Mary's shop sells them to two year olds*

*P3: Yeah we could walk up and be like yeah, can I get smokes? -*

*P2: You could send a six-year-old into that shop*

*P1: Ah yeah, they'd hand a six-year-old smokes like.*

*P2: They'd just say put it in your pocket and don't show anyone*

*Ireland, Girls, Low SES*

These findings were reflected in the survey data, in which many smoking students (10%–45%) reported buying cigarettes from shops. Direct purchase of cigarettes was most commonly reported among adolescents in Belgium, possibly reflecting the country's lower age-of-sale limit. In Italy, 24% of smoking students reported buying cigarettes in shops, with focus group data suggesting these retailers did not necessarily require identification:

*P: I buy cigarettes regularly.*

*F: Where do you buy cigarettes?*

*P: At the tobacco store.*

*F: Do you always go to the same store or anywhere you happen to be?*

*P: Wherever.*

*F: And nobody has ever asked you to show the ID card?*

*P: Never.*

*Italy, Boys, High SES*

Another example of retailer collusion was found in Portugal, where vending machines are often located in bars. Participants indicated some bar staff would routinely "unlock the machine" so they could purchase cigarettes. This illuminates the high proportion of Portuguese students who reported accessing cigarettes via vending machines (33%).

#### Contra-Mechanism A2: Adolescents Develop Strategies That Facilitate Direct Purchase From Retailers or Vending Machines

Participants described using a range of tactics to increase their chances of purchasing cigarettes from retailers. Students in Germany and Ireland mentioned notes from parents giving permission to buy cigarettes for family members. Pretending to have an identity card (in shops) or using an older person's card (with vending machines) were also cited across study sites. Adolescents who appeared older were seen as more successful in buying cigarettes:

*P: People who sell almost never ask for ID. And when they do, it's mostly depending on who it is. It's easy when you look older, not me who looks like 15-14 years old... It was more complicated. But a guy who looks older, 16 or 18, it's easy...*

*Belgium, Boys, Low SES*

Participants in several countries discussed ways of circumventing age verification systems on cigarette vending machines. While adolescents in Portugal reportedly accessed vending machines through non-compliant retailers (see contra-mechanism A1), those in Germany, the Netherlands, and Italy mentioned using older people's identification cards:

*P1: There are a few [vending machines] close to me in [neighbourhood A]*

*P2: Everywhere in [neighbourhood B]*

*...*

*P3: My girlfriend's sister has always bought there, because she uses a kind of... what do you call it? - well, her dead grandfather's ID... She used that ID for that, but then her father found out and he took it away*

*[Participants laugh]*

*Germany, Girls, Low SES*

These narratives are supported by high reported use of vending machines among students in Portugal (33%) and Italy (16%) (Supplementary Table 1). Reported use in Germany and the Netherlands (both 5%) was more modest than might be expected from focus groups, although vending machines may be frequently

used by those that access them (eg, adolescents with “borrowed” identity cards). Limited reference to vending machines among focus groups in Ireland, Belgium, and Finland mirror their low reported use in survey data. Finland has banned vending machines, while those in Ireland are allowed only in licensed premises; Irish participants did not mention staff assistance in accessing vending machines, suggesting higher retailer adherence compared to Portugal. Limited focus on vending machines in Belgium may indicate that cigarettes are more easily obtained from other sources.

Some participants mentioned buying cigarettes in other countries, citing differences in price and age-of-sale as motivating factors. Focus groups in both Belgium and Ireland discussed buying cheaper cigarettes from Luxembourg and Spain (respectively). In the Netherlands, students mentioned buying cigarettes in Belgium:

- P1: But when we're in Belgium, we'll also buy cigarettes.  
 P2: The age is 16 in Belgium.  
 F: During the exchange, of course.  
 P1: Yes, I'll immediately... get myself quite a few packs of cigarettes. Are they expensive over there?  
 P2: No, about the same, right? Or do they have higher taxes?  
 P3: No, I looked it up. It's cheaper.  
 F: Cheaper? You even did some research...  
 P3: 6.50 [Euro] for...  
 P2: Gold?  
 P3: Yes.  
*The Netherlands, Girls, High SES*

#### Contra-Mechanism A3: Adolescents Use Proxy Buyers to Purchase From Retailers (Indirect Access)

Where adolescents believe direct purchase attempts will fail, they may ask others to buy cigarettes on their behalf (proxy purchasing). Many participants reported asking someone they knew to buy cigarettes for them. This could be an older friend or acquaintance, or another minor who looked older. Participants often seemed to know older friends or classmates who would buy cigarettes for them:

- P: Or you ask somebody from school who's already 18...  
 F: OK, and they'll get it for you? P: Yeah.  
*The Netherlands, Boys, High SES*  
 P: ...we also have that friend that has failed year after year and that...  
 P [several]: [laughter]  
 F: Meaning, there's always an 18 year old friend that will save your neck should you need...?  
 P: There's always.  
 P: Yes, yes.  
 P: Even if it is a cousin, an uncle or a brother.  
*Portugal, Boys, High SES*

Reference to older classmates was particularly common in settings where students could repeat school years. As reflected in the survey data, in every country except Finland the participating student cohort included some individuals above the legal age-of-sale. Focus group participants in Finland mentioned older friends as buyers, reflecting the relatively high proportion who reported “buying from friends” (20%) or “asking an adult they knew” to buy cigarettes (12%). These sources were also common in the Netherlands, where 14% reported buying from friends, and 16% asking an adult they knew to buy cigarettes.

Students in all countries approached strangers to buy cigarettes on their behalf, although this was less common in Belgium. Proxy purchases via strangers were a common theme in Finnish,

Irish, and Dutch focus groups. While some adolescents appeared reluctant to approach strangers for fear of being rejected, others seemed confident about the types of people most likely to buy them cigarettes:

- F: And if your usual route doesn't work, say with the shops, how would you get them?  
 P1: Ah, you would just get someone to go in for you  
 F: And who would you get to in for you?  
 P1: Like a stranger, but like someone who is like 20 or something. I wouldn't ask an old person, no way!  
 F: What classifies someone as an old person?  
 P2: Like in their fifties.  
 P1: Like someone in their forties or thirties or like twenties...  
 F: And would they go in for you?  
 P2: Some of them would. Some of them would ask what age you are? And if you say that you are older than what you are, they'll just say, 'ok, all right'.  
 P1: Yeah, like you say you're 16 or 17 and they say 'yeah'  
*Ireland, Girls, Low SES*

Stranger proxies were an important source of cigarettes in Finland, which had the highest prevalence of students who “ask an adult [they] didn't know” to buy them cigarettes (8%)—possibly reflecting the lower accessibility of other sources. Adolescents referred to more marginalized adults—those with addiction issues or “outsiders”—as particularly likely to agree to buy them cigarettes:

- F: ... you mentioned the buyers as one avenue. Who are these buyers?  
 P1: Some outsiders  
 P2: Alkies.  
 P3: Alkies.  
 P?: Addicts.  
 F: Right. “Outsiders”? Are those your friends or are they -?  
 P3: Old people [someone laughs], alcoholics...  
 P2: Junkies.  
 P1: If, for instance, there's a big 1st of May celebration in [large city], then you can be 100 per cent sure that there's someone there who's going to come and ask you, if you hang around the city center, “do you guys need a buyer?”. They'll come by, get you a packet of cigarettes.  
 P?: They'll come.  
*Finland, Boys, High SES*

#### Contra-Mechanism B: Adolescents Access Cigarettes Via Other (Social) Sources

Friends and sometimes family were a common source of cigarettes across study sites. Sharing cigarettes among friends appeared ubiquitous, consistent with friends being the most frequently cited source in survey data. Participants often referred to an informal system of reciprocity in the gifting of cigarettes:

- F: Do you give them away?  
 P1: Yea, I've given them away once or twice.  
 P2: You scratch my back; I'll scratch yours.  
*Germany, Boys, High SES*

Stealing cigarettes from family members was mentioned across all settings. In Belgium, Germany, and the Netherlands, focus group participants spoke of parents buying them cigarettes—consistent with the survey question on “parents or siblings” as a source, which was reported by 12% of smoking students in Germany, 10% in Belgium, and 8% in the Netherlands:

F: You buy your own cigarettes?

P: It's my mother sometimes.

P: My mother too.

P: Sometimes my father buys me my pot of tobacco but I wouldn't say it's every day.

**Belgium, Girls, Low SES**

There were limited references to adolescents buying cigarettes from friends or acquaintances, and in some settings (eg, Portugal) the idea of buying from friends was met with consternation, despite being reported in survey data. In Ireland, participants described older adolescents selling cigarettes at parties—which were seen as a conducive environment in which some young people would “give you all [their] money just to get one cigarette”. Focus group participants in Finland mentioned buying cigarettes from older students, although with some ambivalence:

F: Do the over 18-year-old students, for instance, sell cigarettes at this school?

P1: Well, probably yeah. Or just people our age re-sell them or something.

F: Mm. Do you know a specific person, who peddles cigarettes here at school?

P2: Well, yeah.

P [several]: [laughter]

**Finland, Girls, High SES**

Interestingly, despite being a fairly frequently reported source of cigarettes in survey data (eg, 14% in the Netherlands and 20% in Finland), references to buying from friends were not common in focus groups, and only emerged in response to facilitator probing. It may be that this is seen as a less socially acceptable source of cigarettes in contexts where other sources are available, and where emphasis is placed on social reciprocity in exchange of cigarettes.

## Discussion

Our findings support and enrich the previously developed programme theory describing how age-of-sale restrictions impact youth smoking. Consistent with the theory's primary mechanism (Supplementary Figure 1), we find that adolescents do not attempt to buy cigarettes from commercial sources when they perceive such sources to be inaccessible. However, several contra-mechanisms may undermine this effect. Noncompliant retailers may allow adolescents to purchase cigarettes in contravention of the law, and some adolescents find ways to circumvent the ban, for example, by using an older person's identification card (particularly where vending machines are available) or requesting proxy purchases. Finally, a substantial proportion of young people access cigarettes from social sources such as friends.

Our findings suggest that young people's employment of these contra-mechanisms may be influenced by diverse contextual factors. Where perceived enforcement of age-of-sale restrictions is high (eg, Finland), proxy purchases and social sources were more common while circumvention tactics were less frequent. In contexts where perceived enforcement is low (eg, Belgium), adolescents directly accessed cigarettes from commercial sources and other strategies were less common. The effectiveness of age-of-sale restrictions, therefore, appears to be influenced by a range of contextual factors including retailers' compliance, the availability of vending machines, and the specific age limit on tobacco sales.

Consistent with previous research,<sup>6,7</sup> our data underline the importance of enforcement for improving retailer compliance and strengthening the perception among young people that commercial sources of cigarettes are inaccessible. Improving compliance among smaller, local retailers is a particular priority given the frequency with which participants targeted these outlets. In addition to standard measures such as compliance checks and vendor penalties,<sup>13,14</sup> tobacco license fees may be particularly effective in reducing under-age sales since such fees tend to discourage smaller retailers from stocking cigarettes.<sup>29</sup>

Of particular salience is the extent to which vending machines provide a relatively accessible source of cigarettes for European youth. Our findings support previous research showing the ease with which young people are able to circumvent identification and locking systems,<sup>30–33</sup> which thus do little to reduce under-age access. Total vending machine bans have been shown to reduce smoking in young adults,<sup>34</sup> and while direct evidence of their impact on adolescent smoking is limited,<sup>9</sup> the experience of participants in Finland suggests adolescents' access to cigarettes is substantially reduced in their absence.

Finally, our data point to the important role played by older classmates or acquaintances in supplying young people with cigarettes, a contra-mechanism common across all study sites. Others have noted the potential for an increased age-of-sale to reduce this practice, particularly where older school students are no longer able to purchase cigarettes.<sup>4</sup> This is supported by US evidence, where jurisdictions increasing the legal age-of-sale from 18 to 21 have experienced declines in youth smoking.<sup>35</sup> To date, no European country has increased the age-of-sale limit to 21, and in Belgium (which had the highest reported use of direct commercial purchases) it remains 16. There is a case to be made for increasing and harmonizing the legal age-of-sale across Europe, which has the potential to reduce both under-age access and cross-border sales.

While our analysis highlights the influence of several broad contextual factors, caution should be taken in generalizing these findings since they reflect the experience of selected schools in specific European cities. We compared students' reported cigarette sources across these schools in order to contextualize focus group data; we have therefore not included precision estimates for reported prevalence rates, since these represent the experience of the relevant cohort of students and are not intended for wider generalization. While most study participants were 14–16 years old, a small number were above the legal age-of-sale, which may have affected some findings. Older focus group participants were asked to reflect back to when they could not legally purchase cigarettes, but their recollections may differ from those of younger classmates. It is also important to note that this study examined students residing in cities, the findings may differ for adolescents living in rural areas.

While the combination of survey and focus group data is a particular strength of this study, the two are not always completely aligned. Survey questions did not allow us to assess those cigarette sources that were used most frequently as distinct from those that were most commonly reported. Some survey questions are open to interpretation, for example, the distinction between a young person asking someone else to buy cigarettes on their behalf (proxy purchasing) and a young person buying cigarettes directly from a social source may not be captured consistently. This may explain why proxy purchases were a more dominant theme in focus group data than in the survey results.

This is the first study to examine adolescent access to cigarettes across seven European countries using a mixed-methods approach. This allowed us to develop a more comprehensive picture of adolescents' access than with a single data source, and helps address the notable deficit in qualitative<sup>17</sup> and transdisciplinary<sup>1</sup> research on this topic. It is also the first study to look at the influence of broader contextual factors on the effectiveness of tobacco age-of-sale laws, drawing on a programme theory developed from existing research.

## Conclusion

This study shows that adolescents across Western Europe continue to access cigarettes in the context of age-of-sale restrictions, although the specific mechanisms they use to do so depend on the local context. We note several areas where additional measures may improve the effectiveness of age-of-sale limits in reducing youth smoking, including enforcement of age-of-sale restrictions, retail licensing fees, a complete ban on vending machines, and increasing the legal age-of-sale for tobacco.

## Supplementary Material

Supplementary data are available at *Nicotine and Tobacco Research* online.

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## Declaration of Interests

None declared.

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PN, RH, SH, and AA designed the study. The SILNE-R consortium group all contributed to the data collection of the focus group and survey data. VL and AG provided the descriptive statistics of the survey data. RH, SH, and AA developed the initial coding framework for qualitative analysis. PN and RH coded and analyzed the qualitative data. PN drafted the manuscript. PN, RH, SH, MK, VL, AG, and AA contributed to the interpretation of the findings and the writing of the final manuscript. All authors approved the final manuscript.

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